AP Calculus AB – Worksheet 31 **Answers**

1)

(a) $\lim\limits_{x\to 0}\left(3f(x)-g(x)\right)\approx 3(2)-2=4$

(b) $\lim\limits_{x\to 1} f(x)$ DNE, $\lim\limits_{x\to 1^-} f(x)=1\neq \lim\limits_{x\to 1^+} f(x)=0$

$\lim\limits_{x\to 2} f(x)=1$

$\lim\limits_{x\to 4} f(x)=-1$

$\lim\limits_{x\to 6} f(x)$ DNE, $f(x)$ approaches infinity

(c) $f(-3)=2$

$\lim\limits_{x\to -3} f(x)=-1$

$f(-3)\neq \lim\limits_{x\to -3} f(x)$

$f(x)$ is not continuous at $x=-3$

(d) $f'(0)\approx \dfrac{f(0.001)-f(-0.001)}{0.001-(-0.001)}=\dfrac{2.001-1.999}{0.002}$

2)

(a) $f'(4)\approx \dfrac{f(5)-f(3)}{5-3}=\dfrac{4-(-1)}{2}=\dfrac{5}{2}$

(b) $M'(x)=f'(x)+h'(x)$

$M'(3)=f'(3)+h'(3)$ ⟶ $h'(x)=\dfrac{1}{2}\left(x^2+4x-5\right)^{-\frac{1}{2}}\cdot(2x+4)$

$h'(3)=\dfrac{1}{2}\left((3)^2+4(3)-5\right)^{-\frac{1}{2}}\left(2(3)+4\right)=\dfrac{5}{4}$

$\boxed{M'(3)=8+\dfrac{5}{4}=\dfrac{37}{4}}$

(c) $N'(x)=f(x)\cdot h'(x)+h(x)\cdot f'(x)$

$N'(5)=f(5)\cdot h'(5)+h(5)\cdot f'(5)$

$N'(5)=(4)\left(\dfrac{1}{2}(40)^{-\frac{1}{2}}(14)\right)+\left(\sqrt{40}\right)(3)$

$=\dfrac{14}{\sqrt{10}}+6\sqrt{10}$

$=\boxed{\dfrac{74}{\sqrt{10}}}$

(d) $P'(x)=\dfrac{f(x)\cdot h'(x)-h(x)\cdot f(x)}{\left[f(x)\right]^2}$

$P'(7)=\dfrac{f(7)\cdot h'(7)-h(7)\cdot f'(7)}{\left[f(7)\right]^2}$

$=\dfrac{6\left[\frac{1}{2}(72)^{-\frac{1}{2}}(18)\right]-(72)^{\frac{1}{2}}(-2)}{36}$

$=\dfrac{\frac{1}{\sqrt{2}}+12\sqrt{2}}{36}=\boxed{\dfrac{25\sqrt{2}}{72}}$